

What is claimed is:

- 1 1. A method for maintaining blade tip clearances under part load turbine  
2 operation comprising the steps of:  
3 operating a turbine engine under part load, the engine having a rotor with  
4 discs on which a plurality of turbine blades are attached;  
5 supplying cooling air to the rotor and discs at a substantially constant design  
6 rotor cooling temperature; and  
7 reducing the temperature of the cooling air supplied to the rotor and discs to a  
8 temperature below the design rotor cooling temperature,  
9 wherein exposure to the reduced temperature rotor cooling air causes the  
10 rotor and discs to shrink.
- 1 2. The method of claim 1 wherein the substantially constant design cooling  
2 temperature is from about 350 degrees Fahrenheit to about 480 degrees Fahrenheit.
- 1 3. The method of claim 1 wherein the turbine engine includes a compressor  
2 section having an inlet and an outlet, a plurality of inlet guide vanes being movably  
3 positioned at the compressor inlet.
- 1 4. The method of claim 3 further including the step of:  
2 moving the inlet guide vanes to a closed position so as to reduce the mass  
3 flow of air through the turbine engine,  
4 whereby the combustor exit temperature increases and the compressor exit  
5 temperature decreases.
- 1 5. The method of claim 1 wherein the temperature of the cooling air is reduced  
2 to about 150 degrees Fahrenheit at about 70 percent load.
- 1 6. The method of claim 1 wherein the temperature of the cooling air is reduced  
2 to less than about 350 degrees Fahrenheit.

- 1 7. A turbine engine assembly comprising:  
2 a turbine engine having a compressor section, a combustor section and a  
3 turbine section, the compressor section having an inlet and an exit, the turbine  
4 section including a rotor with discs on which a plurality of turbine blades are  
5 attached, the turbine engine configured so as to supply cooling air to the rotor and  
6 discs at a substantially constant design temperature, wherein the engine is operating  
7 under a part load condition; and  
8 a cooling circuit configured to reduce the cooling air temperature to a  
9 temperature below the design temperature.
- 1 8. The assembly of claim 7 wherein the cooling circuit includes an intermediate  
2 pressure kettle boiler, a low pressure kettle boiler and a heat exchanger connected  
3 in series.
- 1 9. The assembly of claim 8 wherein the heat exchanger uses economizer water  
2 as the sink.
- 1 10. The assembly of claim 8 wherein the heat exchanger uses condenser water  
2 as the sink.
- 1 11. The assembly of claim 8 further including a circuit for at least partially  
2 bypassing the heat exchanger.
- 1 12. The assembly of claim 7 wherein the cooling circuit reduces the temperature  
2 cooling air to below about 350 degrees Fahrenheit.
- 1 13. The assembly of claim 7 wherein the cooling circuit includes at least one heat  
2 exchanger.
- 1 14. The assembly of claim 13 wherein the at least one heat exchanger is a fin-fan  
2 cooler.

1 15. The assembly of claim 7 wherein the turbine engine is part of a simple cycle  
2 system.

1 16. The assembly of claim 7 wherein the turbine engine is part of a combined  
2 cycle system.

1 17. The assembly of claim 7 wherein the cooling circuit reduces the rotor cooling  
2 temperature to about 150 degrees Fahrenheit when the engine is at about 70% load.

1 18. The assembly of claim 7 wherein the substantially constant design cooling  
2 temperature is from about 350 degrees Fahrenheit to about 480 degrees Fahrenheit.